OUR LADY OF THE SACRED HEART COLLEGE
KENSINGTON

STUDENT – NAME _____

MATHEMATICS TEACHER _____

Year 11

Mathematics

Assessment 2

2010

Time allowed: 45 minutes

Assessed Outcomes

P3   Performs routine arithmetic and algebraic manipulation involving surds, simple rational expressions and trigonometric identities

P4   Chooses and applies appropriate arithmetic, algebraic, graphical, trigonometric and geometric techniques

P5   Understands the concept of a function and the relationship between a function and its graph

General Instructions

- Working time – 45 minutes
- Write using a blue or black pen
- Board approved calculators may be used
- All necessary working should be shown in every question

Total Marks – 30

- Attempt all question 1-3
- All questions are of equal value
- Please start each question on a new page
- Don't spend too long on one question
- Good Luck!!!

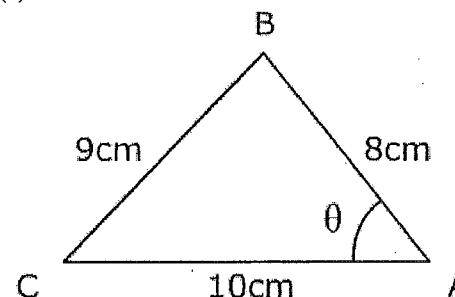**Question 1 (10 marks)**   *Please use a separate page/booklet*

(a)   A ship is 35km east of a lighthouse. The lighthouse is 24km due south of a cliff. What is the bearing of the cliff from the ship, to the nearest minute?   **2**

(b)   Solve: $\cos\theta = \dfrac{-1}{\sqrt{2}}$.   for $0 \le \theta \le 360$ **2**

(c)   Simplify

$$\frac{\sin(360-\alpha)}{\cos(-\alpha)}$$ **2**

(d)

(i) Find θ correct to 3 significant figures   **2**

(ii) Hence, find the area   **2**

Question 2 (10 marks)   *Please use a separate page/booklet*

(a)   Let $y = x^3 - 8x$

    (i)   Find the coordinates of the points where the graph of y crosses the axes.   **2**

    (ii)   Sketch the graph of y.   **1**

(b)   Show that $f(x) = x^3 - 2x$ is an odd function   **1**

(c)   By solving simultaneously, find the x-coordinate of the point of intersection
of the lines   **1**
$$y = \frac{x-5}{3} \quad \text{and} \quad y = \frac{x+1}{5}$$

(d)   Graph the function $y = +\sqrt{25 - x^2}$ and state its domain and range   **3**

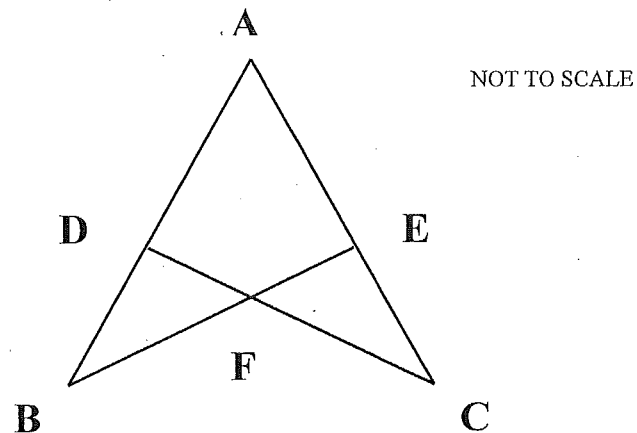(e)   Graph the region given by the inequations: $y \geq 0, |x| > 1$ and $y \leq 2^x$ **2**

Question 3 (10 marks)   *Please use a separate page/booklet*

(a)   The interior angle of a regular polygon is 170°.
How many sides does the polygon have?   **1**

(b)   The volume of a sphere is 40cm², Find its radius to one decimal place   **2**
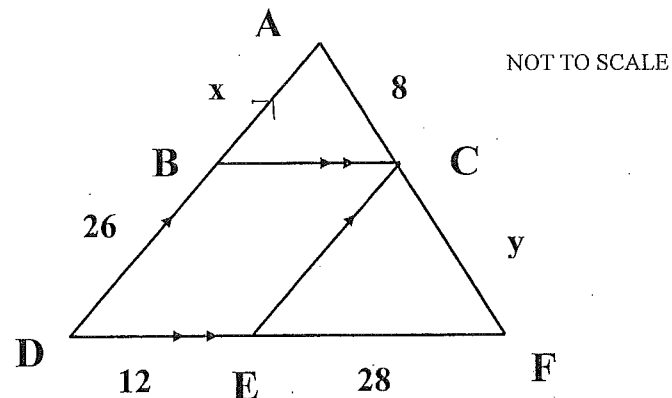
(Question 3 continues on next page)

(c)

NOT TO SCALE

In the diagram above, $\angle ADC = \angle AEB$ and $DB = EC$

    (i)   Prove $\triangle BDF \equiv \triangle CEF$ **2**
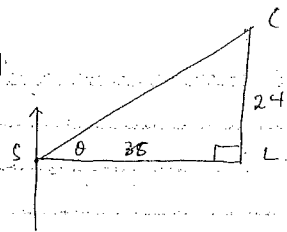
    (ii)   Prove $CD = BE$ **1**

d)

NOT TO SCALE

In the diagram above, BA is parallel to DF and EF is parallel to BC.
Find x and y. Give reasons.   **4**

END OF EXAM

Question 1

(a)

$\dfrac{26}{30}$

$\boxed{7}$

$\tan \theta = \dfrac{24}{35}$

Bearing $= \theta + 270$

$\theta = 34°26'$ ✓ ①

(b) The Acute $\angle$ of $\cos \theta = \dfrac{-1}{\sqrt{2}}$ is 45

$\theta = 135°, 225°$ ✓ ②

3(c) $\dfrac{\cos(-\alpha)}{\cos(-\alpha)} \times 1 = 1$

e) $\sqrt{\dfrac{\sin(360-\alpha)}{\cos(-\alpha)}} = \dfrac{\cos(-\alpha)}{\cos(-\alpha)} \cdot \cos\alpha \cdot \dfrac{\sin(360-\alpha)}{\cos(-\alpha)}$

$\dfrac{\sin 36-\alpha}{\cos(-\alpha)} = \dfrac{\cos(-\alpha)}{\cos(-\alpha)} = 1$
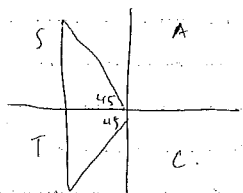
(d)(i) $\cos \theta = \dfrac{8^2 + 10^2 - 9^2}{2(8)(10)}$

$\theta = 58.8°$ ✓ ②

(ii) area of $\triangle = \dfrac{1}{2} ab \sin C$

$\dfrac{1}{2} \times 8 \times 10 \times \sin \left(\dfrac{83}{160}\right) = 34.2 \text{ cm}^2$ ✓ ②
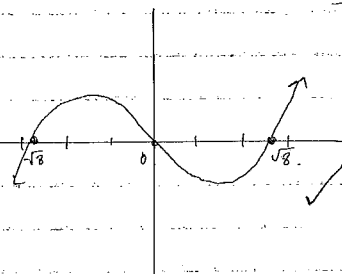
Question 2.

(a) (i) $y = x^3 - 8$

$x^2(x^2 - 8)$

intercepts:

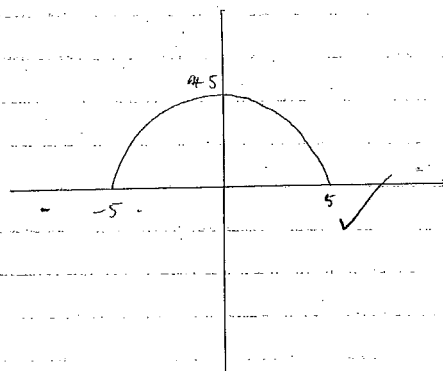$x_1 = \pm \sqrt{8}, 0$

y-int = let $x = 0$.

$(0)^3 - 8(0) = 0$

(b)

③

(b) $f(-x) = (-x)^3 - 2(-x)$

$= -x^3 + 2x$

$= -(x^3 - 2x) = -f(x)$

$\therefore -f(x) = f(-x)$

$\therefore$ function is odd. ①

(c) $\dfrac{x+1}{5} = \dfrac{x-5}{3}$

$3x + 3 = 5x - 25$

$29 = 2x$

$x = 14$ ✓ ①

(d)

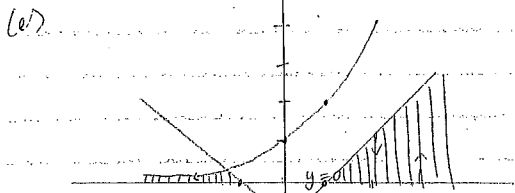D: $-5 \le x \le 5$ ✓

R: $0 \le y \le 5$ ✓

③

③ ④

(e)

$|x| - 1 > 0.$

Test $(0,0)$ to $|x| - 1 > 0.$

$|0| - 1 > 0.$

① Test $(0,0)$

$0 \leq 2^0$

$0 \leq 1.$ ✓

Whoopsies... forgot to start a new page ☺

⑩

Question 3. ← SORRY !

(a) $\dfrac{(n-2)180}{n} = 170$

$(n-2)180 = 170n$

$180n - 360 = 170n$

$10n = 360.$

$n = 36.$ ✓①

(b) $V = \dfrac{4}{3}r^3\pi.$

$\dfrac{4}{3}r^3\pi = 40.$

$\dfrac{\frac{4}{3}r^3\pi}{4\pi} = \dfrac{120}{4\pi}.$

$r^3 = 9.5493$ ✓②

$r = 2.1\ cm.$

(a)
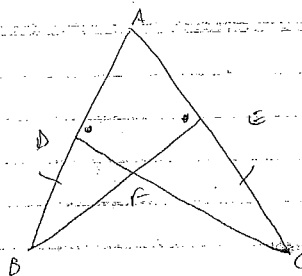
$DB = EC$ (given) ✓ ✓

$\angle FDB = \angle FEC$ ($\angle ADC = \angle AEB$, ∠s on a straight line)

$\angle DFB = \angle EFC$ (vert. opp. ∠s) ✓

$\therefore \triangle BDF \equiv \triangle CEF$ (AAS) ②

(b) (ii) $\triangle BDF \equiv \triangle CEF$ (proved above.)

$DF = EF$ (matching sides of $\equiv$ △s) ✓

$BF = CF$ (corres. sides of $\equiv$ △s) ✓

$BE = BF + FE$ & $CD = CF + DF$ ✓ ①

$\therefore DF + BF = EF + CF.$ ✓

$\therefore CD = BE.$ ✓

(d) $\dfrac{y}{(y+8)} = \dfrac{28}{40}$ (∥ lines CE & AB, cut transversal in =ratio) ✓

$40y = 28y + 224$

$12y = 224.$

$y = 18\frac{2}{3}.$ ✓

$\dfrac{x}{26+x} = \dfrac{8}{26\frac{2}{3}}$ ④

$26\frac{2}{3}x = 208 + 8x.$ ✓

$18\frac{2}{3}x = 208.$

$x = 11\frac{1}{7}.$ ✓